



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
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**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 8764-3, Jonathon Geraets**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Agriculture and Natural Resources concerning Water Permit Application No. 8764-3, Jonathon Geraets, 47138 247th Street, Dell Rapids SD 57022.

The Chief Engineer is recommending APPROVAL of Application No. 8764-3 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing domestic water uses and water rights, 3) the proposed use is a beneficial use and 4) it is in the public interest as it pertains to matters of public interest within the regulatory authority of the Water Management Board with the following qualifications:

1. The well approved under Water Permit No. 8764-3 is located near domestic wells and other wells which may obtain water from the same aquifer. Water withdrawals shall be controlled so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.
2. This Permit is approved subject to the irrigation water use questionnaire being submitted each year.

See report on application for additional information.

Eric Gronlund, Chief Engineer
July 21, 2023

Report to the Chief Engineer
On Water Permit Application No. 8764-3

Jonathon Geraets

July 10th, 2023

Water Permit Application No. 8764-3 proposes to appropriate 1.78 cubic feet per second (cfs) from one well to be completed into the Howard aquifer (approximately 149 feet deep) located in the NE ¼ NE ¼ Section 26 for irrigation of 140 acres located in the NE ¼ Section 26; all in T106N-R49W. The proposed well site is located in Moody County approximately 3 miles southwest of Egan, SD.

AQUIFER: Howard (HO)

Hydrogeology

The Howard aquifer is a Quaternary-aged glacial outwash that consists of very fine to very coarse sand and very fine to fine gravel (Hamilton, 1989). The depth of the Howard aquifer in Moody and Lake Counties ranges from 100 feet to 470 feet below land surface and is under artesian conditions (Hansen, 1986). The average thickness of the Howard aquifer in Moody and Lake counties is 40 feet (Hansen, 1986). In Miner County, the Howard aquifer is estimated to underly approximately 110,100 acres according to Hedges et al. (1982). Hamilton (1989) estimated the aquifer to underly approximately 835 square miles (534,400 acres) in Kingsbury and Brookings Counties. Lindgren and Niehus (1992) estimated the Howard aquifer to underly approximately 15 square miles (9,600 acres) in Minnehaha County. Hansen (1986) estimated the Howard aquifer to underly 675 square miles (432,000 acres) of Lake and Moody Counties. Altogether, the total extent of the Howard Aquifer across six counties (Lake, Moody, Miner, Minnehaha, Kingsbury, and Brookings) is approximately 1,086,100 acres (as shown on Table 1). The direction of groundwater movement in the Howard aquifer is southward (Hamilton, 1989). The Howard aquifer is primarily confined, but there are some locations where the aquifer can be locally unconfined such as observation well MY-90A (Hamilton, 1989; Water Rights, 2023b). Based on observation wells and well completion reports of the Howard aquifer, the Howard aquifer may not be as expansive as previously expected (SDGS, 2023; Water Rights, 2023b and 2023d); however, further study would be required to confirm this.

Table 1. List of the areal extent of the Howard Aquifer

County	Areal Extent (acres)	Source
Brookings & Kingsbury	534,400	Hamilton, 1989
Lake & Moody	432,000	Hansen, 1986
Miner	110,100	Hedges et al., 1982
Minnehaha	9,600	Lindgren and Niehus, 1992

Water Well Completion Report

A water well completion report was submitted with Water Permit Application No. 8764-3 (Water Rights, 2023d). The water well was completed on November 11, 2017. The water well is completed into the Howard aquifer (Water Rights, 2023d). The top of aquifer bearing material is 129 ft below the ground surface, with a static water level of 32 feet below the ground surface, and a saturated aquifer thickness of 20 feet. The water well data indicates the Howard aquifer to be confined at this location with 97 feet of artesian head pressure at the time of well completion.

South Dakota Codified Law (SDCL) 46-2A-9

Pursuant to SDCL 46-2A-9, "A permit to appropriate water may be issued only if there is a reasonable probability that unappropriated water is available for the applicant's proposed use, the proposed diversion can be developed without unlawful impairment of existing domestic water uses and water rights, the proposed use is a beneficial use, and the permit is in the public interest as it pertains to matters of public interest within the regulatory authority of the Water Management Board as defined by SDCL 46-2-9 and 46-2-11." This portion of the report will address the availability of unappropriated water and the potential for unlawful impairment of existing domestic uses and water rights within the Howard aquifer.

WATER AVAILABILITY:

Water Permit Application No. 8764-3 also proposes to appropriate water from the Howard aquifer. The probability of unappropriated water being available from the aquifer can be evaluated by considering SDCL 46-6-3.1, which requires "No application to appropriate groundwater may be approved if, according to the best information reasonably available, it is probable that the quantity of water withdrawn annually from a groundwater source will exceed the quantity of the average estimated annual recharge of water to the groundwater source. An application may be approved, however, for withdrawals of groundwater from any groundwater formation older than or stratigraphically lower than the greenhorn formation in excess of the average estimated annual recharge for use by water distribution systems." The Howard aquifer is not older than or stratigraphically lower than the Greenhorn Formation, and the applicant's proposed use is not for use in a water distribution system as defined by SDCL 46-1-6(17). Therefore, the average annual recharge and average annual withdrawal rates to and from the Howard aquifer must be considered.

HYDROLOGIC BUDGET:

Recharge

Recharge to the Howard aquifer is received primarily through infiltration of precipitation through hundreds of feet of overlying clayey till (Hamilton, 1989). There are also local thick sand deposits in the overlying till layer where greater recharge may occur (Hamilton, 1989). No aquifer specific recharge rate is available for the Howard aquifer. Hamilton (1989) has a recharge rate estimate of 0.01 in/yr but specifically notes it is likely there is a greater recharge rate locally. The small rate is due to the many feet of overlying till which has low transmissivity. However, Hedges et al. (1985) recommend a recharge rate range of 0.15 to 0.6 inches per year

for buried confined aquifers which will be used to estimate recharge (Hedges et al., 1985). While Hamilton (1989) does have a recharge rate estimate, it is more likely the Hedges et al. (1985) recharge is more accurate considering the number of various aquifers across the eastern half of South Dakota that were considered when developing that range. Therefore, the Hedges et al. (1989) recharge rate range will be used for this report. Considering the Howard aquifer underlies approximately 1,086,100 acres across six counties (Lake, Moody, Miner, Minnehaha, Kingsbury, and Brookings) (shown on Table 1); the recharge rate for the Howard aquifer ranges between 13,576 acre-feet/year to 54,305 acre-feet/year. However, the actual recharge to the aquifer could be much lower due to the likely smaller areal extent of the aquifer than what is currently mapped by the various reference sources.

Discharge

Discharge from the Howard aquifer in South Dakota primarily occurs through well withdrawals, fractures in the Sioux Quartzite, the Dell Rapids quarry, and leakage to the underlying Niobrara aquifer (Hansen, 1986). Currently, there are 21 water rights/permits authorized to appropriate water from the Howard aquifer (Water Rights, 2023c). Of those 21 water rights/permits, 15 are non-irrigation water rights/permits and 6 are irrigation water rights/permits (Water Rights, 2023c). There is one future use permit reserving 387 acre-feet/year of water from the Howard aquifer for the City of Madison (Water Rights, 2023c). There is also one other pending application with a priority date senior to this one (Application No. 8758-3) (Water Rights, 2023c).

Table 2 summarizes the 15 non-irrigation water rights/permits authorized to appropriate water from the Howard aquifer with the estimated annual use for each water right/permit as determined by their limiting diversion rate or annual volume. The amount of water that can be withdrawn was estimated by assuming the non-irrigation water rights/permits limited by an annual volume will withdraw their entire appropriated volume every year. It is estimated that non-irrigation water rights/permits limited only by a diversion rate will pump at their maximum permitted diversion rate for 60 percent of the time. The 60 percent estimation was established by Water Rights Staff to be a reasonable and safe estimate of average annual withdrawals by non-irrigation appropriations. Historically, the 60 percent estimate has been accepted by the Water Management Board. It should be noted that some of the permits listed on Table 2 are connected to rural water systems and use rural water rather than their local wells; so, they will not contribute to the annual withdrawal rate. There are three cities listed on Table 2 that receive their water from another source (Drinking Water, 2023.). Both the City of Colman and City of Madison receive their water from the Big Sioux Community Water System; with Colman purchasing 100% of their water and Madison purchasing 27%, the rest is from local wells, of their water from the Big Sioux Community Water System. The City of Howard purchases 100% of their water from Kingbrook II Rural Water System. Based on review of well completion reports, lithological logs, and first occurrence map, Water Right No. 4162-3 is not completed into the Howard aquifer and will not be included in calculations (Jensen, 2002; Water Rights, 2023d). Overall, the estimated annual withdrawal rate for the Howard aquifer non-irrigation water rights/permits is approximately 1,361 acre-feet/year (Table 2) (Water Rights, 2023c).

Table 2. Estimated annual use for non-irrigation water rights/permits authorized to divert water from the Howard aquifer (Water Rights, 2023c)

Permit No.	Name	Status	Uses	Authorized Diversion Rate (cfs)	Authorized Annual Volume (acre-feet)	Estimated Use (acre-feet/year)
5789-3	RAMSDELL'S FERTILIZER & PROPANE INC	LC	COM	0.18	N/A	78.19
8596-3	KINGFISHER ENTERPRISES	PE	COM	0.20	72.60	72.60
5465A-3	BRANDON KARBAN	LC	DOM	0.11	N/A	47.78
5955-3	SD SOYBEAN PROCESSORS	LC	IND	0.44	N/A	192.87
1061-3*	CITY OF COLMAN	LC	MUN	0.00	N/A	0.00
1599-3*	CITY OF HOWARD	LC	MUN	0.00	N/A	0.00
1604-3*	CITY OF MADISON	LC	MUN	0.89	N/A	386.62
1958-3	WINFRED WATER DISTRICT	LC	MUN	0.10	N/A	43.44
244-3*	CITY OF COLMAN	LC	MUN	0.00	N/A	0.00
4813-3	RUTLAND SCHOOL DIST 39-4	LC	MUN	0.03	N/A	14.34
5143A-3*	CITY OF HOWARD	LC	MUN	0.00	N/A	0.00
578-3*	CITY OF HOWARD	LC	MUN	0.00	N/A	0.00
5465-3	LAKE PRESTON	LC	MUN	0.56	N/A	243.26
6511-3*	CITY OF MADISON	LC	MUN	0.63	282.00	282.00
*Acquires water fully or partially from another water system					Total:	1,361
LC Licensed Water Right, PE Water Permit, COM Commercial, DOM Domestic, IND Industrial, MUN Municipal						

Currently, there are 6 irrigation water rights/permits appropriating water from the Howard aquifer (Water Rights, 2023c). Irrigation water rights/permits have been typically required to report their annual usage on an irrigation questionnaire since 1979. The average annual withdrawal rate for the Howard aquifer irrigation water rights/permits that have reported over the period of record (1979 to 2021) is approximately 62 acre-feet per year (Figure 6) (Water Rights, 2023a). To reflect the current development of irrigation water rights/permits more accurately, the average annual withdrawal rate for irrigation appropriations from 2012 to 2021 is approximately 116 acre-feet per year (Figure 6) (Water Rights, 2023a).

There are two pending applications (this application and Application No.8758-3) that are requesting to irrigate a total of 267.5 acres. Generally, irrigators in eastern South Dakota apply less than one foot of water per acre per year. However, one foot of water per acre per year application rate will be used to somewhat overestimate the annual withdrawal rate. Therefore, a total of 267.5 acre-feet per year is being requested for these applications. Collectively, the average annual withdrawal rate for the irrigation appropriations from 2012 to 2021 (116 acre-feet/year), plus the pending applications (267.5 acre-feet/year), is approximately 383.5 acre-feet per year.

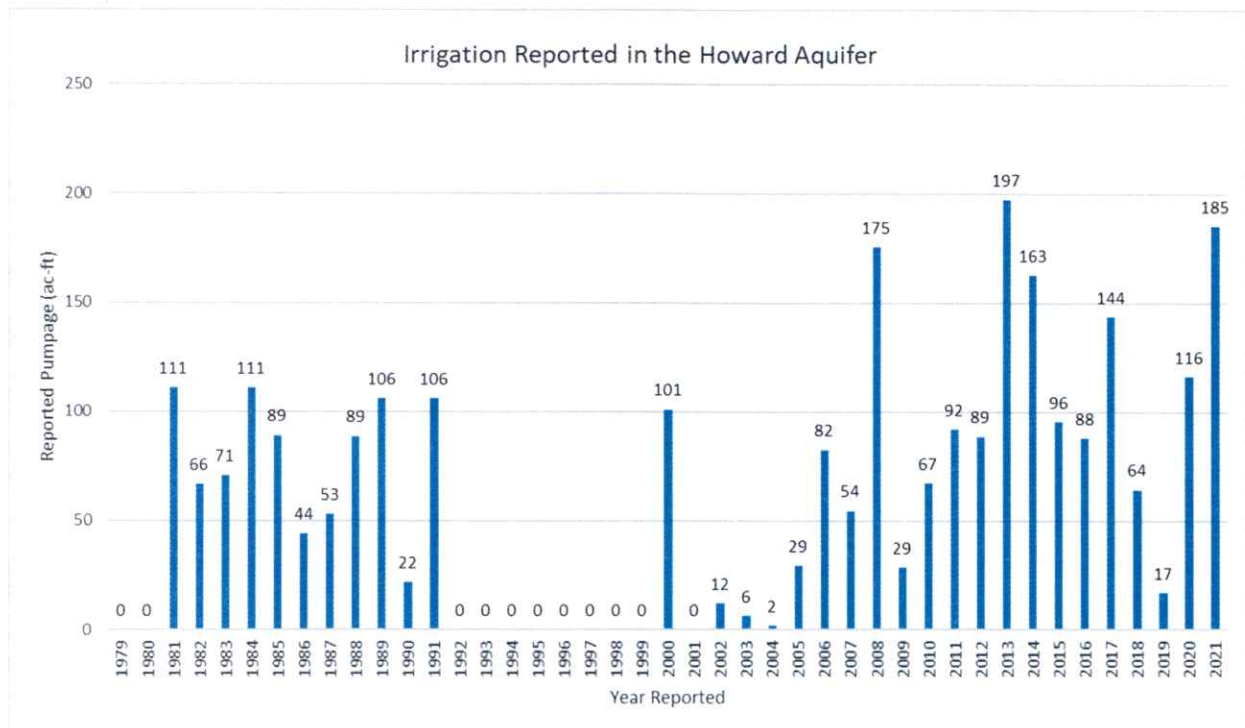


Figure 6: Reported historic irrigation use from the Howard aquifer (Water Rights, 2023a)

There are domestic wells completed into the Howard aquifer that do not require a water right/permit, so the withdrawal amount from those wells is unknown (Water Rights, 2023d). Due to their relatively low diversion rates, withdrawals from domestic wells are not considered to be a significant portion of the hydrologic budget. Additionally, with the development of rural water systems in areas where the Howard aquifer is the uppermost aquifer available; it is likely some domestic users may have transitioned to rural water. Therefore, the quantity of water withdrawn by domestic wells is estimated to be negligible to the hydrologic budget for the Howard aquifer.

Hydrologic Budget Summary

The average annual recharge rate to the Howard aquifer ranges between 13,576 acre-feet/year to 54,305 acre-feet/year (Hedges et al., 1985). The average withdrawal rate from the Howard aquifer totals to approximately 2,131.5 acre-feet/year; (future use: 387 acre-feet/year; non-irrigation: 1,361 acre-feet/year; average irrigation appropriation between 2012 to 2021 plus proposed applications: 383.5 acre-feet/year). While it is likely, the aquifer extent and thus the recharge is smaller than estimated, the estimated average annual use is significantly smaller than the bottom end of the recharge range. Thus, it is reasonable to assume the aquifer is not nearing full appropriation. Based on the hydrologic budget, there is a reasonable probability unappropriated water is available from the Howard aquifer for the proposed appropriation.

OBSERVATION WELL DATA:

Administrative Rule of South Dakota (ARSD) 74:02:05:07 requires that the Water Management Board shall rely upon the record of observation well measurements in addition to other data to

determine that the quantity of water withdrawn annually from the aquifer does not exceed the estimated average annual recharge of the aquifer.

The DANR-Water Rights Program monitors 7 observation wells completed into the Howard aquifer. The location of Water Rights monitored observation wells completed into the aquifer are shown on Figure 7 (Water Rights, 2023b). These observation wells provide data on how the aquifer reacts to regional climatic conditions and local pumping. The closest observation well to the proposed diversion point is MY-90A (approximately 8 miles south) (Water Rights, 2023b). The hydrograph for this observation well is displayed in Figure 8 (Water Rights, 2023b). The data points utilized to construct the hydrographs are measurement of the static water level in the observation wells from the top of the well casing. It is worth noting the hydrograph titles display DENR Water Rights Observation Well on the hydrographs when the titles should display DANR Water Rights Observation Well on hydrographs. The data shown on Figure 8 matches potentiometric contours of the Howard aquifer in Moody County (Hansen, 1986). The majority of observation wells in the Howard aquifer have generally stable water levels over their periods of record.

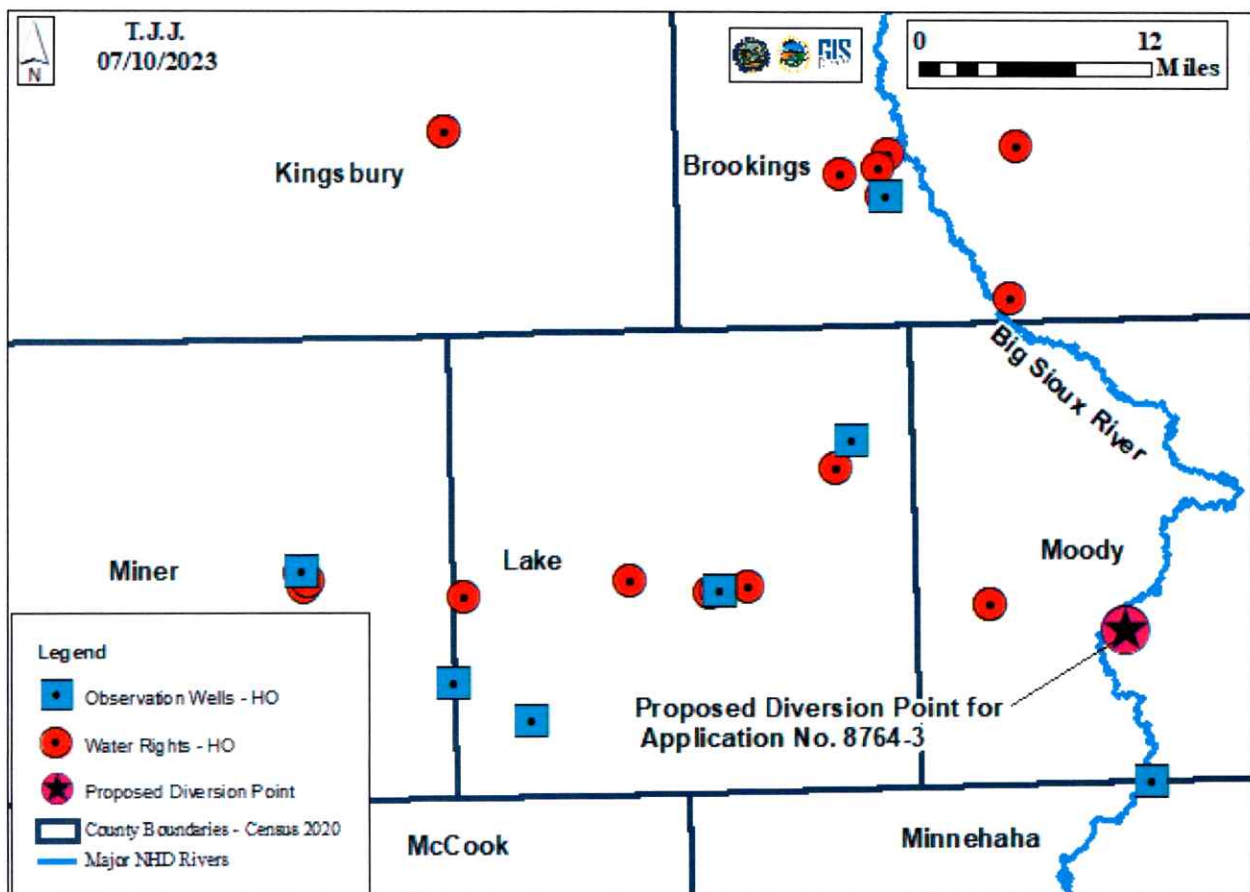


Figure 7. Map of the area Howard aquifer water rights/permits/observation wells (Water Rights, 2023b and 2023c), and the location of diversion point for Water Permit Application No. 8764-3.

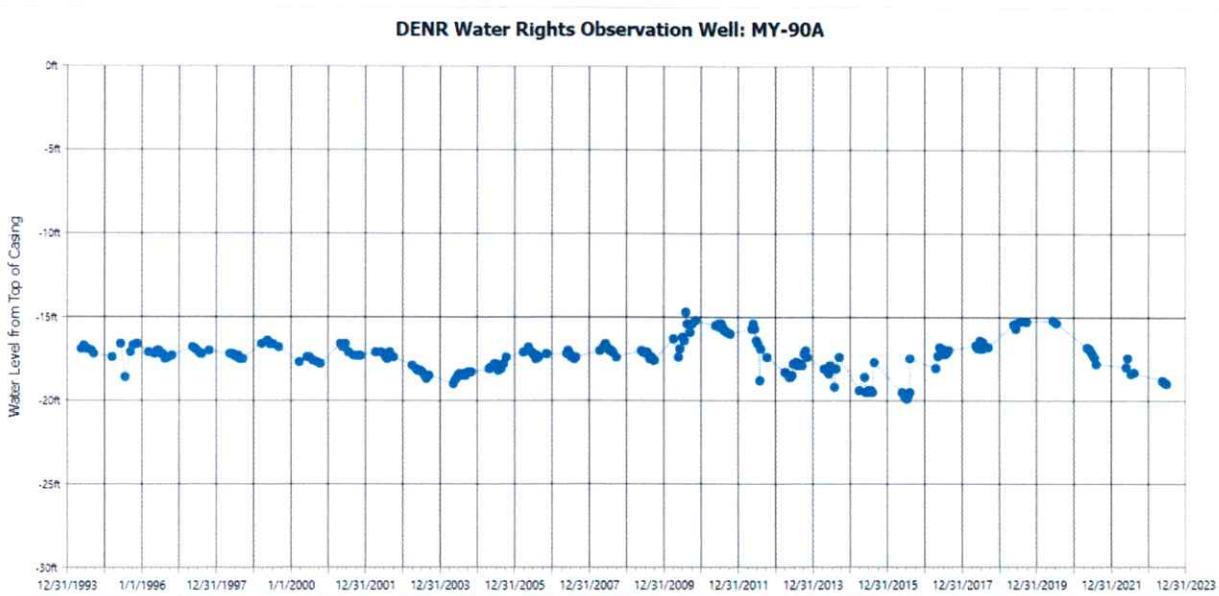


Figure 8. Hydrograph for observation well MY-90A (Water Rights, 2023b)

The hydrographs for the Howard aquifer indicate that the aquifer responds well to climatic conditions because water levels are rising during wetter periods (early spring snowmelt and precipitation) and declining to a stable water level during drier periods. Additionally, the water levels in the observation wells display that the amount of recharge to and natural discharge from the aquifer greatly exceeds pumping with the aquifer returning to pre-pumping conditions between irrigation seasons. Aquifer recovery indicates that climatic conditions and therefore, the effects of recharge to and natural discharges from the aquifer govern the long-term fluctuations of water levels in the aquifer rather than the impacts of pumping from the Howard aquifer. By recognizing that both recharge to and natural discharge from an aquifer can be captured for pumping, the observation well hydrographs demonstrate unappropriated water is available for the proposed appropriation.

POTENTIAL FOR UNLAWFUL IMPAIRMENT OF EXISTING WATER RIGHTS:

Water rights/permits appropriating water from the Howard aquifer in the general vicinity of the existing well site for this application are shown in Figure 9 and summarized in Table 3 (Water Rights, 2023c). The closest water right/permit to the diversion point is Water Right Nos. 244-3 & 1061-3 which are both held by City of Colman. However, the City of Colman receives their water from another system so the next closest water right/permit will be used. The next closest water right/permit to the diversion point is Water Right No. 4813-3 which is held by Rutland School District. The diversion point for Water Right No. 4813-3 is located approximately 17.3 miles northwest of the diversion point for this application (Water Rights, 2023c). There are domestic wells on file with the DANR-Water Rights Program that are completed into the Howard aquifer, with the closest domestic well on file (not held by the applicant) approximately 0.2 miles southwest of the diversion point based on the well completion report submitted by the driller (Water Rights, 2023d). The location of the domestic wells is based on the information provided by the well driller on the submitted well completion report. There could potentially be

other domestic wells completed into the Howard aquifer near the diversion point that are not on file with the DANR-Water Rights Program.

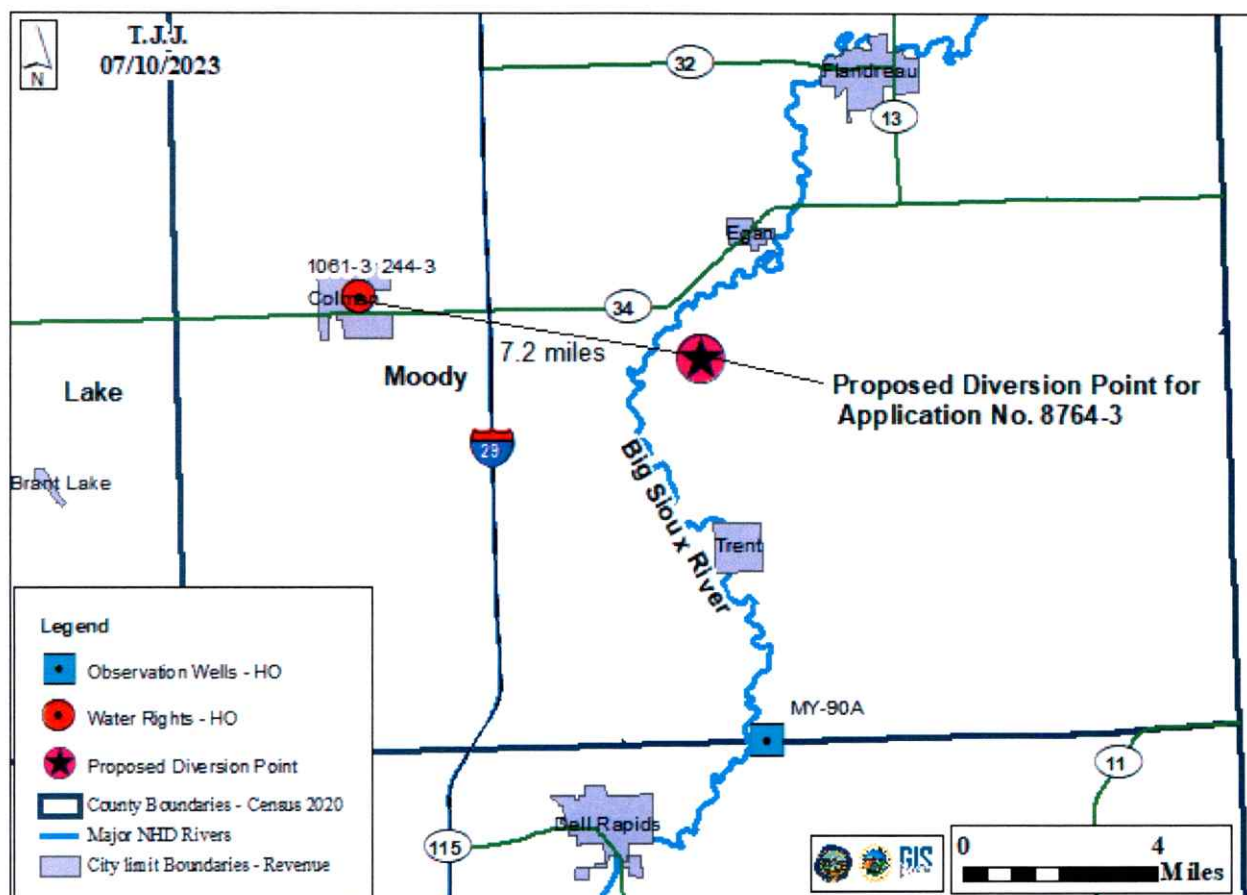


Figure 9. Map of the Howard aquifer water rights/permits within 8 miles of the proposed diversion point (Water Rights, 2023b and 2023c), and the location of diversion point for Water Permit Application No. 8764-3.

Table 3. List of water rights/permits shown in Figure 9.

Permit	Name/Business	Priority	Status	Use Type	CFS	Acres
244-3*	City of Colman	08/22/1956	License	Municipal	0.22	0
1061-3*	City of Colman	01/01/1947	License	Municipal	0.22	0

*These Water Rights receive their water from another water system

The Howard aquifer is primarily under confined conditions. In an confined aquifer, drawdown created by pumping can extend some distance from the pumped well. The Water Management Board recognizes that putting water to beneficial use requires a certain amount of drawdown to occur. The Board has developed rules to allow water to be placed to maximum beneficial use without the necessity of maintaining artesian head pressure for domestic use. The Water Management Board defined an “adversely impacted domestic well” in ARSD 74:02:04:20(7) as:

“A well in which the pump intake was set at least 20 feet below the top of the aquifer at the time of construction or, if the aquifer is less than 20 feet thick, is as near to the bottom of the aquifer as is practical and the water level of the aquifer

has declined to a level that the pump will no longer deliver sufficient water for the well owner's needs."

The Water Management Board considered the delivery of water by artesian head pressure versus maximum beneficial use during the issuance of Water Right No. 2313-2 for Coca-Cola Bottling Company of the Black Hills. The Board adopted the Findings of Facts and Conclusions of Law that noted the reservation of artesian head pressure for delivery of water would be inconsistent with SDCL 46-1-4 which states, "general welfare requires that the water resources of the state be put to beneficial use to the fullest extent of which they are capable..." (Water Rights, 1995). Furthermore, the Water Management Board found if increased cost or decreased production as a result of impacts on artesian head pressure by legitimate users is to be considered as an unlawful impairment, it would also conflict with SDCL 46-1-4 (Water Rights, 1995). With that in mind, some existing well owners may need to install or lower pumps depending on the specific characteristics of the Howard aquifer at their location. However, when considering the statutes (SDCL 46-1-4 and 46-6-6.1), rules (ARSD 74:02:04:20 (6) and (7)), the saturated aquifer thickness near the diversion point, and the lack of recent well interference complaints for adequate wells completed into the Howard aquifer in Moody County (Water Rights, 2023e), any drawdown created from the diversion is not expected to cause an unlawful impairment on existing water right/permit holders or domestic users with adequate wells. Therefore, there is a reasonable probability that any interference from the proposed appropriation will not impose unlawful impairments on existing users with adequate wells.

CONCLUSIONS:

1. Water Permit Application No. 8764-3 proposes to appropriate 1.78 cfs from one well to be completed into the Howard Aquifer (approximately 149 feet deep) located in the NE $\frac{1}{4}$ NE $\frac{1}{4}$ corner Section 26 for irrigation of 140 acres located in the NE $\frac{1}{4}$ Section 26; all in T106N-R49W.
2. Based on observation well data and the hydrologic budget, there is a reasonable probability that unappropriated water is available from the Howard aquifer to supply the proposed appropriation.
3. There is a reasonable probability that the diversion by Water Permit Application No. 8764-3 will not unlawfully impair adequate wells for existing water rights/permits and domestic uses in the Howard aquifer.

Reviewed by:



Tyler Jensen
Natural Resources Engineer I
SD DANR - Water Rights Program



Adam Mathiowetz, PE
Natural Resources Engineer IV
SD DANR - Water Rights Program

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